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RADIO COMMUNICATIONS AND RADIO BROADCASTING IN THE SOVIET UNION

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The great invention of A. S. Popov, radio, born in our country, is developing at an exceptionally rapid rate and in the most varied directions of its use.

Radio communications occupy an important place in the general system of electric communications of the Soviet Union with its boundless spaces. In many directions radio communications are combined with wire systems of communications; but in a number of cases radio is the sole means of communication. This refers above all to the communications of the center with remote points of the North and Far East many thousands of kilometers away. Moreover, radio communication remains an irreplaceable means of communication under conditions of the impassable wilderness of Siberian forests and other natural obstacles difficult to surmount.

The main role in radio communications over long distances belongs as before to short waves. The technology of short-wave radio communications is being steadily perfected, the stability of communications at any time of the day and year, and also the passing capacity of the radio line are rising. The main feature of modern short-wave trunk line radio communications is the wide installation of frequency keying systems in telegraphy. These have substantially higher resistance to interference when compared to amplitude keying. Equipment of 2-channel frequency telegraphy, DChT, has been created in USSR and put into widespread use since 1949. It was worked up by I. F. Agapov in developing a proposal of A. N. Schukin. Each channel of the DChT system is loaded with several start-stop telegraph sets. A considerable number of transmitting and receiving sets that formerly operated only with amplitude keying have been shifted to the system of frequency keying.

In recent years industry has begun to produce radio transmitters of new types for main line and intra-oblast communications, such as KV-678, KV-5, PK-2, PK-4 which have high quality indexes. All these transmitters allow for operations both as telegraph and as telephone. Frequency and amplitude keying can be applied in the telegraph operation.

Industry has developed and put into production a new type of receiver for trunk lines of communications.

Despite the substantial results achieved through use of frequency keying and the improved equipment, on days when short-wave passing conditions are particularly difficult, intermediate relaying has to be set up on certain long distance lines of communication. For the relay stations special equipment for regeneration of the forms of telegraph signals has been developed and installed. Especially noteworthy herewith is the method of integral reception with employment of the principle of storing the condenser charge. This device gives signal correction even under strong distortions and breakings; moreover, it has interference-proof properties.

In the Soviet Union, in addition to long distance radio communications on short waves, there is a big network of low power radio stations that

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provide communications over comparatively short distances of several scores of kilometers. Belonging to this local subordinate radio network are above all radio stations of the "Uroshay" type which serve internal farm dispatch communications in the rural economy. Practice has shown how great a role such communication plays in the matter of better utilization of the huge amount of technical equipment which has been assigned to agriculture. The local radio communication has particularly great importance in the campaign to bring virgin and waste lands under cultivation.

Many other branches of the national economy also make wide use of the means of radio communication. However, it should be acknowledged that there is still much disorder in this affair. In particular, the stability of radio-transmitter frequency and the discipline in use of radio frequencies is inadequate, with the result that mutual interference is great.

Local radio communication can service the requirements of the national economy much more effectively. Both the Ministry of Communications USSR and industry, and also the communication departments of the respective branches of the national economy, at whose disposal are found the radio means, must pay a great deal more attention to this matter.

The development of radio communications is characterized by the exceptionally rapid growth of the number of radio stations of the most varied designation, which is accompanied by the increase of mutual interference. Therefore, along with heightening the stability of the frequency of transmitters and research in methods of more economic use of the spectrum of frequencies in the short-wage range, successful work is being conducted in the broad mastery of still more short waves: the meter, decimeter, and centimeter waves. Radio stations on ultra-short waves are being increasingly installed in local communications. In those cases when communication with employment of ultra-short waves must be established at distances upwards of 40 to 50 km, radio relaying is arranged. When it is necessary to get several channels, a radio relay set with phase impulse modulation is applied, for it does not require special equipment of high frequency packing.

Centimeter waves have proved a remarkable means for organizing wide-band communications and at considerable distances (thousands of kilometers) by means of arranging a circuit of consecutive relays of signals from one intermediate station to another. Such radio relay lines of communication permit the creation of radio trunk lines of several hundred telephone channels; besides, standard coaxial cable packing equipment is employed.

V. I. Lenin, the great genius of mankind, first indicated the special importance of radio as a means of uplifting the political and cultural level of the broad masses of toilers.

The main task in the field of radio-broadcasting technology now is to bring radio broadcast programs with high-quality sound to the whole population of the Soviet Union. In broadcasting, as in the field of communications, this task is being solved by complex use of various technical means depending on the concrete conditions of definite territorial zones.

From its birth in 1922, radio broadcasting's fundamental technical means have been long-wave and medium-wave radio stations. With the object of enlarging the zone serviced, station power has in proportion to technical progress been gradually increased.

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Recently, however, the reception conditions of radio-broadcasting stations in the European territory of USSR has greatly deteriorated, owing to the substantially increased interference on the part of a number of foreign stations. Such a situation has been caused on the one hand by the steady increase in the number of radio-broadcasting stations of Europe, but is mainly the result of the American occupation forces in Western Europe having broken the international agreement on the distribution of frequencies among stations.

Thus, according to the Copenhagen plan of 1948, the USSR received for the territory to longitude 40° east, 16 frequency channels of exclusive use and 20 channels of joint (with foreign stations) use. At present we do not in fact have a single channel of exclusive use in consequence of the fact that the Americans and certain states of Western Europe have built a number of powerful stations that operate on wave lengths assigned to Soviet stations.

In conditions of greatly increased radio interference and difficulties of direct reception, the value of a system of wire broadcasting has been confirmed. Work is at present underway on perfection and development of a radio relaying system of broadcasting. In large cities which embrace more than 10,000 subscribers of radio rebroadcasting networks, the systems are being widely reconstructed according to the 3-member construction with the object of improving the quality of sounding, and reducing the cost of their erection and operation. Every such network has booster substations, the power of which reaches 50 to 60 kw in a number of cities. Besides automatic servicing of substations, remote control of their operation is being widely promoted.

As a rule, programs are sent to the large radio rebroadcast networks along special broadcast channels of interurban main line communications, which secures high-quality sound without any kind of interference.

However, a great number of radio rebroadcast units receive programs on radio receivers. Deterioration of radio reception conditions therefore leads in many cases to unsatisfactory quality of the sound of radio loudspeaker points. With the object of drastic improvement in the quality of broadcasting, a number of new radio stations are at present being built in accordance with directives of the Twenty-ninth Congress of the Communist Party of the Soviet Union.

Equally with this, the acute need has arisen to realize new technical means that will provide radio broadcasting free of radio interference. Such means are the ultra-short waves whose radius of action is limited to 50 to 60 km under average conditions and with transmitting antenna approximately 120 m in height.

By employing frequency modulation of the ultra-short wave transmitter, high quality reception is easily obtained. In order to organize reception of programs over an extensive territory, it is necessary to erect ultra-short wave radio stations every 100 to 120 km apart. The program must be delivered to these radio stations along wire channels, but in many cases it can be rebroadcast, reception of the transmission being accomplished from the neighboring ultra-short wave station.

The number of transmitters that are installed at one or another point depends on the number of programs (central and local) which must be transmitted in the given district.

Considering the great advantages of radio broadcasting on ultra-short waves, the Twenty-Ninth Congress of the Communist Party of the Soviet Union

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pointed in its directives to the need of its wide development. However, this directive is as yet being badly fulfilled. It is quite necessary in the near future to begin practical realization of the Congress instructions.

Radio broadcasting is one of the very effective means of embracing the widest mass of the rural population in the cultural and political life of our country. It must nevertheless be noted that radiofication of rural localities still continues to lag badly. In accordance with a decree of the Council of Ministers USSR and of the Central Committee of the Communist Party of the Soviet Union, the radiofication of inhabited rural areas must be completed in the near future. To accomplish this task it is necessary to carry out a large task in the construction of new rural radio centers and the development of a radio rebroadcasting network.

Some time ago in radiofication of rural-area, low-power collective-farm radio units, units of approximately 10 w capacity or less were installed. Such units could not get high quality service and were unprofitable. Now, in the radiofication of rural places, it is planned to construct sufficiently large intercollective farm units, and also to install widely remote control of collective farm radio units and their supply.

In localities where reception free of interference cannot at present be secured by means of radio receivers, delivery of programs to rural radio rebroadcast units along wires by means of special high frequency equipment will be widely installed.

Great success has been achieved in recent years in the field of the technology of television, with the result that television broadcasting is beginning to be widely developed. For the entire Soviet Union a single standard of picture fidelity has been established, corresponding to scanning in 625 lines at 25 frames per second. The band of frequencies of video signals occupies 6 Mc, and the total width of the frequency channel of each television station (together with the sound accompaniment transmitted on ultra-short waves with frequency modulation) amounts to 8 Mc. Such standards provide high-quality transmission of pictures, and the further technical perfection of television devices must be done not in the direction of increasing the number of lines of scanning, but by means of the perfection of all elements of the television line both in transmission and in reception.

The Soviet population manifests great interest in television broadcasting, one of the remarkable means of the communist education of toilers. New television centers are being built in many cities. Measures are being taken to expand the broadcast range of television centers. For this purpose construction is planned at a number of points of rebroadcasting stations which will receive programs either by cable as programs are already being received in the city of Kalinin, or by radio relay lines.

Our industry is already producing about 10 types of television receivers with screens of various sizes, and in particular, the television receiver "Temp" which has a screen 240 mm by 320 mm in size. In 1954 about 300,000 television sets were produced, and this year their output is being doubled. Besides, a number of improvements are being introduced in the television receivers. For example, in the television receivers "Temp" and "Avangard" a channel switch-over is being introduced, the range is being enlarged to receive sound broadcasts on ultra-short waves with frequency modulation, the sensitivity of the radio receivers is being heightened. It is planned to produce television receivers with

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rectangular picture tubes, the diagonal of whose screens will be 35, 43, and 53 cm. A television projection receiver with a screen of about one m^2 is being developed. Such sets should find wide use in clubs, Red Corners, houses of rest, etc.

Earmarked in plans for the next few years are the very wide development of television broadcasting and the construction of television centers in many cities of the Soviet Union.

The transition to color television is an important direction of the further technical development of television. Our industry has developed a system of color television in which the basic colors red, green, and blue are transmitted in turn, and reception is accomplished on a special television set with a three-color disc light filter rotating in front of the screen of the picture tube. Since the end of last year the Moscow television center has conducted experimental transmissions of color television by such a system.

However the technical council of the Ministry of Communications USSR did not find it possible to accept the alternating system of color television for wide installation, owing to its requiring a considerably wider band of transmitting frequencies than the existing system of black-and-white television. Therefore, and also for certain other technical reasons, alternating color transmissions cannot be received on ordinary television sets. On the other hand, it is impossible to receive transmissions of black-and-white television on the special television sets of the alternating system of color television. In brief, these systems are incompatible. Meanwhile, modern technology permits the creation of a system of color television with simultaneous transmission of colors within the limits of the frequency band apportioned in accordance with the standard for black-and-white television. The chief new element in this system is the special television receiving tube with a 3-color screen. Appropriate elaborations are being conducted in laboratories, and wide installation of color television must necessarily be postponed until their completion.

Contributions to the achievements attained in radio communications and radio broadcasting have been made by the Soviet scientists and engineers M. A. Bonch-Bruyevich, M. V. Shuleykin, A. I. Berg, B. A. Vvedenskiy, V. A. Kotel'nikov, A. L. Mints, and many others who have made a large contribution to the work of radio development. There is no doubt that Soviet radio specialists will also in the future multiply the achievements of Russian radio technology.

Radio technology in the service of the Soviet people plays a most important role in the building of Communist society, and the consciousness of this role inspires all workers of radio, from the academician to the rank-and-file radio operator, to new scientific and technical achievements for the glory of our fatherland.

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